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THE GOLDEN NEMATODE

A New Potato Menace



BUREAU OF ENTOMOLOGY AND
PLANT QUARANTINE
Agricultural Research Administration
U. S. DEPARTMENT OF AGRICULTURE

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Suppression of the golden nematode is a joint undertaking of the New York State Department of Agriculture and Markets and the Federal Bureau of Entomology and Plant Quarantine. The research phases of this work are conducted under cooperative agreement by Cornell University and the Federal Bureau of Plant Industry, Soils, and Agricultural Engineering. All States are participating in a Nation-wide survey to establish the presence or absence of the golden nematode in other potato- or tomato-growing areas.

For further information regarding the golden nematode write to the Bureau of Entomology and Plant Quarantine, Washington 25, D. C., or to the Golden Nematode Control Project, P.O. Box 104, Hicksville, Long Island, N. Y.

The GOLDEN NEMATODE is a serious pest of potatoes and tomatoes. It is a major potato pest in Europe, and recently has become established in a small potato-growing area on Long Island, N. Y.

The exact source and time of introduction of the golden nematode into this country have not been determined. Since 1912, Federal quarantines have prohibited the entry of potatoes from practically all European countries. All plant material coming into the United States is required to be free from soil. Nevertheless in 1941 the pest was found damaging a potato field on Long Island south of Hicksville, Nassau County. This nematode was discovered after a potato grower asked State officials why some of his plantings had given reduced yields for several years. No established infestation is known to occur elsewhere in the United States.

This soil-infesting organism is eel-like in shape, thin as the finest hair, and less than 1/50 inch in length.

Extent of Damage

These nematodes literally suck the life out of the potato roots. The plants are stunted and die early, with consequent reduction in size and yield. From 30 to 70 percent reduction in potato yields has been reported from heavily infested fields on Long Island.

In such soils thousands of these tiny nematodes attack the roots of a single plant. In England potatoes cannot be grown profitably more than one year in five to eight where high populations of the pest are present.

Agencies of Spread

The golden nematode cannot move very far without aid. It is therefore spread principally in soil, adhering to seed potatoes, plants, or equipment from infested fields, and by careless disposal or re-use of bags or other containers utilized in harvesting, storing, or shipping potatoes.

Quarantines are thus designed to prevent spread of the pest by regulation of potential carrier materials, such as potatoes, tomato and other vegetable plants, nursery stock, topsoil, used machinery, and containers from exposed or infested lands.

Seasonal Development

Eggs and larvae of this nematode pass the winter in the body of the dead female, which has developed into a thick-walled brown protective cyst (see cover). In the spring, if the cysts are located near the roots of host plants and if temperatures are favorable, the eggs hatch and the larvae migrate to attack these roots. The larvae bore into the roots, as well as the tubers, to a point where the heads are near the vascular system. Then the nematodes undergo a series of changes. The

males remain free-moving forms, but the females become more or less stationary. A mature male dies without changing shape. As a female matures, the posterior portions of the body enlarge and break through the outer layer of the root. The body finally becomes spheroid in shape, and a protective cuticle begins to form. As the cuticle ages, the body, or cyst, changes color from white to golden brown; hence the common name "golden nematode." From 38 to 48 days are required for the cycle from egg to adult.

The cyst is about as large as the head of a small pin. It may contain from one to several hundred eggs. Eggs may remain viable in a cyst more than 10 years.

How Infestations Are Detected

Golden nematode infestations can be detected by examination of the host-plant roots, but surveys are conducted primarily by the examination of soil samples.

Collection of Soil Samples. -- Soil-sampling surveys outside of Long Island were started shortly after the nematode was first found in this country. They have been expanded each year, to cover all the commercial potato- and tomato-producing areas in the United States. Sample lots of soil are collected at sites where host material has been grown, stored, or handled, and also at nurseries, greenhouses, and refuse-disposal points. About 1 tablespoonful of soil is taken on the end of a pointed

trowel every 8 paces in a grid pattern. In this way from 4 to 6 pounds is obtained from each acre surveyed. In case an infestation is found, a re-survey is run in which soil is collected every 2 to 4 paces.

Examination of Soil Samples.--The procedure developed for the recovery of the cysts from soil samples is based on the fact that they float when dry. A sample must be fairly dry before it is processed. It is then placed in a white enamel pail and roiled with a strong stream of water. The material that floats is poured into a second pail and allowed to stand while the first pail is refilled by the roiling method. The floating material in the second pail is poured off into a third pail. This process is repeated as long as particles continue to rise and float on the surface. All flotsam is then passed through two sieves. The top one, of 20-mesh screen, withholds coarse material, and the second sieve, of 60-mesh screen, retains finer particles of soil, seeds, and nematode cysts when present. This material is then transferred to shallow dishes and examined under the microscope by trained technicians.

Difficulty of Control

Control of the golden nematode is very difficult because of its ability to survive in the soil for long periods in the absence of host crops and also because of its resistance to chemicals. The infrequent growing of potatoes and tomatoes, the only known commercial host crops, will retard build-up of

nematode populations to destructive levels. Rotation of crops cannot be used as an eradication measure unless host crops are excluded for many years. The nematode has no known natural enemies.

Quarantines and withholding of infested lands from production of potatoes and tomatoes have been adopted as control measures in this country. No other known method will prevent spread of the pest from Long Island to other parts of the United States.

Sanitation Measures

Scientists of Cornell University and the Bureau of Plant Industry, Soils, and Agricultural Engineering have found that certain commodities can be freed from viable nematode cysts. They recommend the immersion of mature potatoes for 5 minutes in water at 132° F., which they say will kill the eggs and larvae within any cysts that may be present. Potatoes thus treated are then safe for general distribution. Farm equipment can be cleaned with steam.

A more effective method of killing nematodes on farm machinery, involving the use of methyl bromide under a gasproof tarpaulin, has been developed by Cornell University. Burlap bags infested with cysts can be fumigated with methyl bromide either in a fumigation chamber or under a gasproof tarpaulin. The dosage recommended is 6 milliliters per cubic foot for 16 hours, and the temperature should be 65° F. or above.

PRECAUTIONS

Methyl bromide is a poisonous gas. It has no distinctive odor. It is particularly dangerous at high temperatures and should not be stored in buildings where people live or work.

Since methyl bromide is known to be injurious to humans, persons not familiar with handling fumigants are cautioned against using it until they have thoroughly familiarized themselves with the necessary precautions.

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